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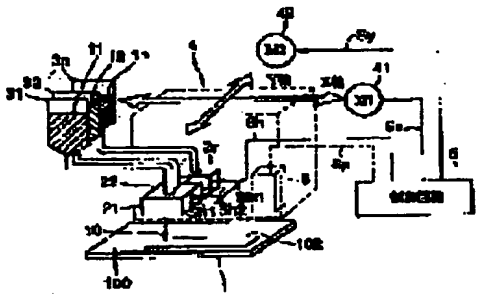
(54) ELECTRIC CIRCUIT, ITS MANUFACTURE AND MANUFACTURE DEVICE THEREOF

(57)Abstract:
PROBLEM TO BE SOLVED: To manufacture an arbitrary electric circuit on a pattern forming face through the use of an ink jet system.
SOLUTION: Fluid bodies 11-1n containing conductive materials and insulating materials as pattern forming materials are discharged from ink jet-type recording heads 21-2n on the pattern forming face 100 of a substrate 1. The fluid bodies 11-1n discharged on the pattern forming face 110 are caked and an electric circuit 102 is obtained. Since an arbitrary pattern is generated while the materials are changed into various types, the electric circuit containing the desired circuit elements of a capacitor, a coil, a resistor and an active element can be manufactured.



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CLAIMS

[Claim(s)]

[Claim 1] The electrical circuit which is an electrical circuit formed in a pattern formation side, and is characterized by having the pattern with which the fluid containing the charge of pattern formation material adhered to said pattern formation side, and was solidified and formed in it.

[Claim 2] The electrical circuit according to claim 1 further equipped with the compatibility layer for raising the adhesion of said pattern formation side and said pattern.

[Claim 3] The electrical circuit according to claim 1 further equipped with the non-compatibility layer for restricting the adhesion field of said pattern.

[Claim 4] Said charge of pattern formation material is an electrical circuit according to claim 1 which is either among a conductive ingredient, a half-conductivity ingredient, an insulating ingredient, or a dielectric ingredient.

[Claim 5] An electrical circuit [equipped with the circuit pattern which the fluid which contained the conductive ingredient as said charge of pattern formation material solidified] according to claim 1.

[Claim 6] The electrical circuit according to claim 1 which resembles the insulator layer which the fluid which contained the insulating ingredient or the dielectric ingredient as said charge of pattern formation material solidified, and the electrode layer which the fluid which contained the conductive ingredient as said charge of pattern formation material countered and solidified on both sides of said insulator layer, and constitutes a capacitor more.

[Claim 7] The electrical circuit according to claim 1 where the fluid which contained the conductive ingredient as said charge of pattern formation material equips said pattern formation side with the coil which adhered to a whirl and was solidified.

[Claim 8] The electrical circuit according to claim 1 which equips the both ends of the

half-conductivity film which the fluid which contained the half-conductivity ingredient as said charge of pattern formation material solidified with the resistor which the fluid which contained the conductive ingredient as said charge of pattern formation material solidified.

[Claim 9] The electrical circuit according to claim 1 where the fluid containing the half-conductivity ingredient with which the predetermined element was doped as said charge of pattern formation material is equipped with the semi-conductor circuit element formed by solidifying.

[Claim 10] The electrical circuit according to claim 1 where color which is different in order to have said two or more patterns and to identify a mutual pattern is attached.

[Claim 11] The manufacture approach of the electrical circuit characterized by having the process which carries out the regurgitation of the fluid which included the charge of pattern formation material in said pattern formation side in the manufacture approach of the electrical circuit which forms an electrical circuit in a pattern formation side, and the process which solidifies the fluid breathed out by said pattern formation side.

[Claim 12] The manufacture approach of the electrical circuit according to claim 11 which maintains the temperature near [said] a pattern formation side to temperature lower than the melting point of said charge of pattern formation material, and solidifies said fluid at the process which solidifies discharge and said fluid for the ingredient which heated said fluid at the process which carries out the regurgitation more than the melting point of said charge of pattern formation material, and dissolved as said fluid.

[Claim 13] At the process which carries out the regurgitation of said fluid, the process which solidifies discharge and said fluid as said fluid said charge of pattern formation material stirred by the solvent as a particle The manufacture approach of an electrical circuit [equipped with the process in which the temperature more than the melting point of said charge of pattern formation material is applied to for the temperature near / said / a pattern formation side, and said particle is dissolved, and the process which solidifies the ingredient which applied temperature lower than the melting point concerned, and dissolved] according to claim 11.

[Claim 14] The manufacture approach of the electrical circuit [equipped with the process which forms the compatibility layer for raising the adhesion of said pattern formation side and said pattern before carrying out the regurgitation of said fluid] according to claim 11.

[Claim 15] The manufacture approach of the electrical circuit [equipped with the process which forms the non-compatibility layer for restricting the adhesion field of said pattern before carrying out the regurgitation of said fluid] according to claim 11.

[Claim 16] The manufacture approach of the electrical circuit characterized by having the process which carries out the regurgitation of the adhesive ingredient to said pattern formation side, the process which sprinkles the particle of the charge of pattern formation material to said pattern formation side, and the process which removes said particles other than the thing adhering to said adhesive ingredient from said pattern formation side in the manufacture approach of the electrical circuit which forms an electrical circuit in a pattern formation side.

[Claim 17] The manufacture approach of the electrical circuit according to claim 16 further equipped with the process in which the temperature more than the melting point of said charge of pattern formation material is applied for the temperature near [said] a pattern formation side after the process which removes said particle from a pattern formation side, and said particle is dissolved, and the process which solidifies the ingredient which applied temperature lower than the melting point concerned, and dissolved.

[Claim 18] The manufacture approach of the electrical circuit according to claim 16 further equipped with the process which compresses said particle adhering to said adhesive ingredient after the process which removes said particle from a pattern formation side.

[Claim 19] Said charge of pattern formation material is the manufacture approach of the electrical circuit according to claim 11 to 16 which is any one or more [of a conductive ingredient, a half-conductivity ingredient, an insulating ingredient, or the dielectric ingredients].

[Claim 20] The manufacture approach of the electrical circuit according to claim 11 to 18 which forms a capacitor by breathing out the fluid containing said insulating ingredient, forming an insulator layer, breathing out the fluid which contained said conductive ingredient so that it might counter on both sides of the insulator layer concerned, and forming an electrode layer.

[Claim 21] The manufacture approach of the electrical circuit according to claim 11 to 18 which breathes out the fluid containing said conductive ingredient to a whirl, and forms a coil.

[Claim 22] The manufacture approach of the electrical circuit according to claim 11 to 18 which forms a resistor by breathing out the fluid containing said half-conductivity ingredient, forming the half-conductivity film, breathing out the fluid which contained said conductive ingredient to the both ends of the half-conductivity film concerned, and forming the conductive film.

[Claim 23] The manufacture approach of the electrical circuit according to claim 11 to 18

which forms a semi-conductor circuit element repeatedly two or more times while changing the element which dopes the process which breathes out the fluid containing the half-conductivity ingredient with which the predetermined element was doped, and forms the semi-conductor film to said fluid.

[Claim 24] The manufacture approach of the electrical circuit according to claim 11 to 18 which makes two or more patterns identifiable by mixing the pigment or color of a color which is different in the fluid for forming the pattern according to a pattern, and forming a pattern.

[Claim 25] The manufacture approach of the electrical circuit according to claim 11 to 18 which makes two or more patterns identifiable by forming the layer which covers the pattern formed with said fluid and contains the pigment or color of a color according to the pattern.

[Claim 26] The ink jet type recording head which is an electrical circuit manufacturing installation for forming the pattern of arbitration on a pattern formation side with the fluid containing the charge of pattern formation material, and was constituted by said pattern formation side possible [the regurgitation] in said fluid, The drive constituted possible [modification of the relative position of said ink jet type recording head and said pattern formation side], The solidification equipment which adjusts an ambient atmosphere in order to solidify the fluid on said pattern formation side, It has the control unit which controls the drive by the regurgitation of said fluid from said ink jet type recording head, and said drive, and adjustment of the ambient atmosphere by said solidification equipment. Said control unit Said fluid is made to breathe out from the ink jet type recording head concerned, moving said ink jet type recording head along with the pattern of arbitration with said drive. The electrical circuit manufacturing installation characterized by being constituted possible [formation of an electrical circuit] by solidifying the fluid which adjusted the ambient atmosphere of said pattern formation side with said solidification equipment, and was breathed out by said pattern formation side.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to amelioration of the electrical circuit manufacturing technology for starting the manufacturing technology of the electrical circuit to a substrate etc., especially forming the electrical circuit of arbitration with an ink jet method etc.

[0002]

[Description of the Prior Art] The lithography method etc. has been used for manufacturing a minute circuit, for example, an integrated circuit, conventionally. This lithography method applies thinly the sensitization material called a resist on a silicon wafer, can be burned with light and imprints the circuit pattern created by photoengraving process to the glass film plate. Ion etc. is driven into the imprinted resist pattern and the circuit pattern and the circuit element are formed. Since processes, such as photoengraving process, resist spreading, exposure, and development, were needed for manufacture of the electrical circuit using the describing [above] lithography method, when it was not the chip fabrication factory where the facility was ready, manufacture of an electrical circuit was not completed. Moreover, in order to have manufactured the big electrical circuit, discrete part has been arranged by the insertion machine etc. on a substrate, it let the substrate pass to the solder tub, and the electrical circuit substrate was made. Also about the electrical circuit manufactured with such a production line, the insertion machine, the flux tub, the solder tub, etc. were required for the consistent manufacturing facility. On the other hand, soldering by a developer attaching all components using an omnipotent substrate etc. was manufacturing by carrying out manufacture of the prototype of an electrical circuit. As mentioned above, in order to mass-produce an electrical circuit, while plant-and-equipment investment and complicated production control were required, producing a prototype had taken an effort and time amount.

[0003]

[Problem(s) to be Solved by the Invention] Since current serves as a time of limited production with a wide variety, the conventional manufacture approach is however, efficient and necessarily economical [current] less. That is, the time amount which a setup and adjustment take in a setup of a manufacturing facility since redo is required whenever the electrical circuit which manufactures is changed increases, and it has been hard coming to stop cost in a production line. Moreover, two or more prototypes were made to coincidence, adding examination was daily performed to it, and even manufacture of a prototype of spending many hours only on manufacture of a prototype by handmade was uneconomical. moreover, although various physical constants of a circuit element were boiled and changed and the prototype estimated the circuit, the

approach of attaching passive circuit elements to a substrate had taken the effort, in order to exchange components, when a physical constant is changed. Since a physical constant was decided by passive circuit elements, modification of a delicate physical constant was still more difficult for it. Although the circuit pattern which becomes complicated in order to examine a circuit furthermore needed to be identified with the prototype, in wiring by conventional solder and lead wire, it saw and glanced at the substrate and there was also a trouble that it was unclear what kind of pattern it was. /cgi-bin/tran_web_cgi_ejje?u=http%3A%2F%2Fwww4.ipdl.ncipi.go.jp%2FTokujitu%2Ftjitemdrw.ipdl%3FN0000%3D237%26N0500%3D1E%5FN%2F%3B%3E%3E%3D8%3B98%3E%2F%2F%2F%26N0001%3D210%26N0552%3D9%26N0553%3D00002on branch to the manufacturing technology of an electrical circuit.

[0004]

[Means for Solving the Problem] That is, the 1st technical problem of this invention is offering the electrical circuit suitable for little variety production or a prototype by forming a pattern by the approach which did not exist conventionally. The 2nd technical problem of this invention is offering the electrical circuit suitable for little variety production or a prototype by forming a circuit element by the approach which did not exist conventionally. The 3rd technical problem of this invention is offering the electrical circuit suitable for a prototype by forming the pattern which is easy to identify. The 4th technical problem of this invention is offering the manufacture approach of an electrical circuit of having been suitable for little variety production or a prototype by forming a pattern by the approach which did not exist conventionally. The 5th technical problem of this invention is offering the manufacture approach of an electrical circuit of having been suitable for little variety production or a prototype by forming a circuit element by the approach which did not exist conventionally. The 6th technical problem of this invention is offering the manufacture approach of an electrical circuit of having been suitable for the prototype by forming the pattern which is easy to identify. The 7th technical problem of this invention is offering the electrical circuit manufacturing installation suitable for little variety production or a prototype by having the configuration which forms a pattern by the approach which did not exist conventionally.

[0005] Invention which solves the 1st technical problem of the above is an electrical circuit formed in a pattern formation side, and is an electrical circuit equipped with the pattern with which the fluid containing the charge of pattern formation material adhered to the pattern formation side, and was solidified and formed in it.

[0006] Although various kinds of approaches, such as various print processes, are applicable as an approach to which a fluid is made to adhere here, being based on an ink jet method is desirable. It is because a fluid can be made to adhere to the location of the

arbitration of a pattern formation side by the thickness of arbitration with a cheap facility according to the ink jet method. Even if it is the piezo jet method which makes a fluid breathe out by the volume change of a piezo electric crystal component as an ink jet method, when a steam occurs rapidly by impression of heat, you may be the method which makes a fluid breathe out. Moreover, a fluid means the medium equipped with the viscosity in which the regurgitation is possible from the nozzle. ** which is oiliness as it is aquosity is not asked. If it has from the nozzle etc. the fluidity (viscosity) in which the regurgitation is possible, even if it will be enough and the individual matter will mix, what is necessary is just a fluid as a whole. A fluidity can be measured, for example according to the contact angle of the fluid. For example, as the above-mentioned charge of pattern formation material, you may have either among the conductive ingredient, the half-conductivity ingredient, the insulating ingredient, or the dielectric ingredient. What was heated more than the melting point and dissolved could be stirred as a particle in the solvent, and these ingredients may add the color and the high-performance material of a pigment and others other than a solvent. Moreover, an electrical circuit is not limited only to the member realized with the electric collaboration relation between circuit elements, and is mechanically applied to a design-pattern widely. That is, it is not limited to the pattern formed not having the specific electric description and having electrical characteristics with a fixed pattern formation ingredient. Moreover, a pattern formation side points out the front face of a flat substrate, and also may be a curved-surface-like substrate. You may be a front face, although the degree of hardness of a pattern formation side does not need to be still harder and it has flexibility, such as a film, paper, and rubber.

[0007] This invention is further equipped with the compatibility layer for raising the adhesion of a pattern formation side and a pattern further. Moreover, it has further a non-compatibility layer for restricting the adhesion field of a pattern. Non-compatibility says the relative target to a fluid the property in which a contact angle is large here. Compatibility means that the contact angle over a fluid is relatively small. These expressions are used as contrasted with compatibility, in order to clarify behavior of the film to a fluid.

[0008] Invention which solves the 2nd technical problem of the above is an electrical circuit equipped with the circuit pattern which the fluid which contained the conductive ingredient as a charge of pattern formation material solidified. Moreover, it is the electrical circuit which resembles the insulator layer which the fluid which contained the insulating ingredient or the dielectric ingredient as a charge of pattern formation material solidified, and the electrode layer which the fluid which contained the

conductive ingredient as a charge of pattern formation material countered and solidified on both sides of the insulator layer, and constitutes a capacitor more. Moreover, the fluid which contained the conductive ingredient as a charge of pattern formation material is the electrical circuit which equips a pattern formation side with the coil which adhered to a whirl and was solidified. It is the electrical circuit which equips the both ends of the half-conductivity film which the fluid which furthermore contained the half-conductivity ingredient as a charge of pattern formation material solidified with the resistor which the fluid which contained the conductive ingredient as a charge of pattern formation material solidified. Moreover, the fluid containing the half-conductivity ingredient with which the predetermined element was doped as a charge of pattern formation material is an electrical circuit equipped with the semi-conductor circuit element formed by solidifying.

[0009] Invention which solves the 3rd technical problem of the above is an electrical circuit where color which is different in order to have two or more patterns and to identify a mutual pattern is attached.

[0010] Invention which solves the 4th technical problem of the above is the manufacture approach of the electrical circuit equipped with the process which carries out the regurgitation of the fluid which included the charge of pattern formation material in the pattern formation side, and the process which solidifies the fluid breathed out by the pattern formation side in the manufacture approach of the electrical circuit which forms an electrical circuit in a pattern formation side.

[0011] For example, at the process which solidifies discharge and a fluid for the ingredient which heated the above-mentioned fluid at the process which carries out the regurgitation more than the melting point of the charge of pattern formation material, and dissolved as a fluid, the temperature near a pattern formation side is maintained to temperature lower than the melting point of the charge of pattern formation material, and a fluid is solidified. Moreover, at the process which carries out the regurgitation of the above-mentioned fluid, the process which solidifies discharge and a fluid for the charge of pattern formation material stirred by the solvent as a particle as a fluid is equipped with the process in which the temperature more than the melting point of the charge of pattern formation material is applied to for the temperature near a pattern formation side, and a particle is dissolved, and the process which solidifies the ingredient which applied temperature lower than the melting point concerned, and dissolved. Moreover, before carrying out the regurgitation of the fluid, it has the process which forms the compatibility layer for raising the adhesion of a pattern formation side and a pattern. Before carrying out the regurgitation of the fluid furthermore, it has the

process which forms the non-compatibility layer for restricting the adhesion field of a pattern.

[0012] Similarly this invention is the manufacture approach of the electrical circuit equipped with the process which carries out the regurgitation of the adhesive ingredient to a pattern formation side, the process which sprinkles the particle of the charge of pattern formation material to a pattern formation side, and the process which removes particles other than the thing adhering to an adhesive ingredient from a pattern formation side in the manufacture approach of the electrical circuit which forms an electrical circuit in a pattern formation side. Moreover, you may have the process in which the temperature more than the melting point of the charge of pattern formation material is applied to for the temperature near a pattern formation side, and a particle is dissolved, and the process which solidifies the ingredient which applied temperature lower than the melting point concerned, and dissolved. You may have the process which compresses the particle which furthermore adhered to the adhesive ingredient.

[0013] The above-mentioned charge of pattern formation material is any one or more [of a conductive ingredient, a half-conductivity ingredient, an insulating ingredient, or the dielectric ingredients] here.

[0014] Invention which solves the 5th technical problem of the above is the manufacture approach of the electrical circuit which forms a capacitor by breathing out the fluid containing an insulating ingredient, forming an insulator layer, breathing out the fluid which contained the conductive ingredient so that it might counter on both sides of the insulator layer concerned, and forming an electrode layer. Moreover, it is the manufacture approach of the electrical circuit which breathes out the fluid containing a conductive ingredient to a whirl, and forms a coil. It is the manufacture approach of the electrical circuit which forms a resistor by breathing out the fluid which furthermore contained the half-conductivity ingredient, forming the half-conductivity film, breathing out the fluid which contained the conductive ingredient to the both ends of the half-conductivity film concerned, and forming the conductive film. Moreover, it is the manufacture approach of the electrical circuit which forms a semi-conductor circuit element repeatedly two or more times, changing the element which dopes to a fluid the process which breathes out the fluid containing the half-conductivity ingredient with which the predetermined element was doped, and forms the semi-conductor film.

[0015] Invention which solves the 6th technical problem of the above is the manufacture approach of the electrical circuit which makes two or more patterns identifiable by mixing the pigment or color of a color which is different in the fluid for forming the pattern according to a pattern, and forming a pattern. Moreover, by forming the layer

which covers the pattern formed with the fluid and contains the pigment or color of a color according to the pattern, it is the manufacture approach of the electrical circuit which makes two or more patterns identifiable.

[0016] Invention which solves the 7th technical problem of the above is an electrical circuit manufacturing installation for forming the pattern of arbitration on a pattern formation side with the fluid containing the charge of pattern formation material. The ink jet type recording head constituted by the pattern formation side possible [the regurgitation] in the fluid, The drive constituted possible [modification of the relative position of an ink jet type recording head and a pattern formation side], It has the control unit which controls adjustment of the ambient atmosphere by the solidification equipment which adjusts an ambient atmosphere in order to solidify the fluid on a pattern formation side, and the drive by the regurgitation of the fluid from an ink jet type recording head, and the drive and a solidification equipment. And the control device is constituted possible [formation of an electrical circuit] by solidifying the fluid which was made to breathe out a fluid from the ink jet type recording head concerned, moving an ink jet type recording head along with the pattern of arbitration with a drive, adjusted the ambient atmosphere of a pattern formation side with the solidification equipment, and was breathed out by the pattern formation side.

[0017]

[Embodiment of the Invention] Hereafter, the best gestalt for carrying out this invention is explained with reference to a drawing. The same member shall be shown when the same sign as other operation gestalten is used with each following operation gestalt.

(Operation gestalt 1) The operation gestalt 1 of this invention manufactures the electrical circuit which contained the capacitor using the ink jet method. The block diagram of an electrical circuit manufacturing installation used for drawing 1 with this operation gestalt 1 is shown. As shown in drawing 1 , this electrical circuit manufacturing installation is equipped with the ink jet type recording heads 21-2n (n is the natural number of arbitration), Tanks 31-3n, the drive 4, and the control circuit 5. It is constituted possible that this electrical circuit manufacturing installation makes the predetermined pattern (electrical circuit) 102 form in the pattern formation side 100 of a substrate 1 by making the drop 10 of a fluid adhere.

[0018] If the ink jet type recording heads 21-2n are equipped with the respectively same structure and constituted by the ink jet method possible [the regurgitation / a fluid], they are enough. Drawing 29 R> 9 is a decomposition perspective view explaining the example of 1 configuration of an ink jet type recording head. As shown in drawing 29 ,

ink jet type recording head 2x (x is either 1 - n) insert in a case 250 the pressure room substrate 220 with which the nozzle plate 210 and diaphragm 230 with which the nozzle 211 was formed were formed, and are constituted. This principal part structure of ink jet type recording head 2x is equipped with the structure which put the pressure room substrate 220 with the nozzle plate 210 and the diaphragm 230 as shown in the perspective view part sectional view of drawing 30 . The nozzle 211 is formed in the location which will correspond to a cavity 221 when a nozzle plate 210 is stuck with the pressure room substrate 220. Two or more cavities 221 are formed in the pressure room substrate 220 possible [a function] for each as a pressure room by etching a silicon single crystal substrate etc. It is separated by the side attachment wall (septum) 222 between cavities 221. Each cavity 221 is connected with the reservoir 223 which is common passage through the feed hopper 224. A diaphragm 230 is constituted by for example, the thermal oxidation film etc. The ink tank opening 231 is formed in a diaphragm 230, and tank 3x are consisted of possible [supply of fluid 1x of arbitration]. The piezo electric crystal component 240 is formed in the location equivalent to the cavity 221 on a diaphragm 230. The piezo electric crystal component 240 is equipped with the structure which sandwiched the crystal of piezoelectric ceramics, such as a PZT component, with the up electrode and the lower electrode (not shown). It is constituted possible that the piezo electric crystal component 240 produces a volume change corresponding to the regurgitation signal Shx supplied from a control circuit 5.

[0019] In addition, although the above-mentioned ink jet type recording head was the configuration of having made a piezo electric crystal component producing a volume change, and making a fluid breathing out, you may be the head configuration which heat is applied [configuration] to a fluid with a heating element, and makes a drop breathe out by the expansion.

[0020] Tanks 31-3n store Fluids 11-1n, respectively, and the ink jet type recording heads 21-2n constitute 11-1n of each fluid possible [supply] through the pipe. As for Fluids 11-1n, each is installed according to the function of a pattern including a pattern formation ingredient. Fluid itself shows electrical characteristics, such as conductivity, half-conductivity, insulation, or a dielectric, at the time of solidification, and consists of especially these operation gestalten. For example, what heated the metal of low-melt point points, such as solder, a gallium, and Pb, more than the melting point, and gave the fluidity, and the thing which shows electrical characteristics only by the particle of a pattern formation ingredient being included in high density, and drying a fluid after the regurgitation are mentioned. Viscosity is adjusted and a fluid is constituted from any case by the solvent etc. so that the fluidity in which the regurgitation is possible may be

presented from an ink jet type recording head. In addition, in order that this operation gestalt may make the talk easy to understand, a fluid 12 shall contain [a fluid 11] a conductive ingredient including an insulating ingredient.

[0021] The drive 4 is equipped with a motor 41, a motor 42, and the machine structure that is not illustrated. The motor 41 is constituted by X shaft orientations (longitudinal direction of drawing 1) possible [conveyance] in ink jet type recording head 2x according to the driving signal Sx. The motor M2 is constituted by Y shaft orientations (the depth direction of drawing 1) possible [conveyance] in ink jet type recording head 2x according to the driving signal Sy. In addition, the drive 4 is enough if it has relatively the configuration which can change for the location of ink jet type recording head 2x to a substrate 1. For this reason, the substrate 1 other than the above-mentioned configuration may move to ink jet type recording head 2x, and both ink jet type recording head 2x substrates 1 may move.

[0022] A control circuit 5 is equipped with CPU which is a computer apparatus and is not illustrated, memory, an interface circuitry, etc. When a control circuit 5 performs a predetermined program, making the equipment concerned enforce the manufacture approach of the electrical circuit of this invention is constituted possible. That is, in making the drop 10 of a fluid breathe out, when supplying the regurgitation signals Sh1-Shn to ink jet type recording heads [21-2n] either and moving the head concerned, it is constituted by motors 41 or 42 possible [supply of driving signals Sx or Sy].

[0023] In addition, when fixed ambient atmosphere processing is needed from ink jet type recording head 2x to the drop 10 of a fluid, you may have the solidification equipment 6 further. Corresponding to the control signal Sp with which a solidification equipment 6 is supplied from a control circuit 5, physical and performing physicochemical and chemical preparation to a drop 10 or the pattern formation side 100 are constituted possible. For example, the fluid which adhered by heating / desiccation processing by blasting of hot blast, laser radiation, and lamp exposure, the chemical change processing by administration of a chemical, fixed surface treatment processing to the pattern formation side 100 of a drop 10 that controls extent of adhesion is solidified, or adhesion of a drop 10 is promoted.

[0024] (Operation) In the configuration of the above-mentioned electrical circuit manufacturing installation, if a substrate 1 is installed in the equipment concerned, a control circuit 5 will output driving signals Sx or Sy. Motors 41 or 42 change the relative position of ink jet type recording head 2x and the pattern formation side 100 of a substrate 1 corresponding to these driving signals Sx or Sy, and move head 2x to a pattern formation field. subsequently, the class of pattern which should be formed --

conductivity, half-conductivity, and insulation -- or according to dielectric electrical characteristics, Fluids [11-1n] either is specified, and the regurgitation signal Shx for making the fluid breathe out is supplied. Each fluids 11-1n are flowing into the corresponding cavity 221 of ink jet type recording head 2x. In ink jet type recording head 2x to which the regurgitation signal Shx was supplied, the piezo electric crystal component 240 produces a volume change with the electrical potential difference applied between the up electrode and lower electrode. This volume change is made to transform a diaphragm 230, and changes the volume of a cavity 221. Consequently, the drop 10 of a fluid is breathed out towards the pattern formation side 100 from the nozzle hole 211 of that cavity 221. The fluid which decreased in number by the regurgitation is newly supplied to the cavity 221 by which the fluid was breathed out from tank 3x.

[0025] (The manufacture approach) Next, based on drawing 2 thru/or drawing 4 , the formation approach of the capacitor of this operation gestalt is explained. In each drawing, (a) shows the production process sectional view cut with the center line of a circuit element, and (b) shows a top view.

Insulator layer formation process (drawing 2) : First, the ink jet type recording head 21 is moved to the field which forms an insulator layer, as shown in drawing 2 (a), and the fluid 11 which contains an insulating ingredient as a pattern formation ingredient from the head 21 concerned is made to breathe out. As an insulating ingredient, SrTiO3, BaTiO3, and the Pb(Zr, Ti) O3 grade which are SiO2, aluminum 2O3, and a dielectric can be considered. PGMEA, a cyclohexane, carbitol acetate, etc. are mentioned as a solvent. As a wetting agent or a binder, a glycerol, a diethylene glycol, ethylene glycol, etc. may be added if needed. Moreover, as a fluid 11 containing an insulating ingredient, the metal alkoxide containing polysilazane or an insulator ingredient may be used. In this case, an insulator ingredient can be formed by heating, a chemical reaction, etc. The breathed-out fluid 11 reaches the pattern formation side 100. The fluid 11 which reached the target has an about dozens of micrometers diameter. If a head 21 is moved like drawing 2 (b) and the regurgitation of the fluid 11 is continuously carried out along a pattern formation field, a rectangular insulator layer pattern can be formed macroscopically. The dielectric constant of the width of face of an insulator layer 101, die length, and an insulating ingredient is defined according to the capacity of a capacitor to form. It is because the capacity of a capacitor becomes settled with the area, gap, and dielectric constant of a counterelectrode. What is necessary is just to manufacture to a laminated structure as it carries out discharge solidification of the still more nearly same fluid on the once solidified film, in thickening membranous thickness.

[0026] since there is no electric bad influence even if the film which was solidified and was formed is not the precise film when a fluid contains an insulating ingredient, a solvent component is evaporated -- being sufficient . However, heat-treating in order to strengthen the film is desirable. Moreover, when solidifying an insulator layer by the chemical reaction, it is possible to process with a chemical which brings about destruction of a dispersed system. For example, when a fluid 11 uses as a principal component the organic pigment distributed with styrene-acrylic resin, the regurgitation of the magnesium nitrate water solution is carried out as reaction mixture. Moreover, when a fluid 11 uses an epoxy resin as a principal component, the regurgitation of the amines is carried out as reaction mixture. It is desirable to perform solidification, whenever it forms one pattern. It is because an ingredient is mixed, so desired electrical characteristics will not be acquired if the regurgitation of the fluid which contained other pattern formation ingredients in the fluid which is not solidified in piles is carried out.

[0027] In addition, a dielectric ingredient may be used instead of an insulating ingredient as a pattern formation ingredient. It is because the capacity of a capacitor can be made to increase if it makes inter-electrode fill up with a dielectric ingredient. Moreover, with two or more ingredients, it may be parallel and two or more insulator layers may be formed. It is because the function similar to the multilayer structure of a capacitor can be given. Moreover, when there are few gaps of an electrode, it is desirable to choose an insulating ingredient as this insulator layer shows non-compatibility to to the fluid 12 containing the conductive ingredient breathed out behind. It is because the insulator layer formed crawls a fluid 12, so risk of an electrode short-circuiting decreases.

[0028] Electric conduction film formation process (drawing 3 and drawing 4) : If an insulator layer 101 solidifies, the ink jet type recording head 21 will be moved to the field which forms the electric conduction film as shown in drawing 3 (a) and drawing 4 (a). Subsequently, the fluid 12 which moves a head 22 like the arrow head of drawing 3 (b) and drawing 4 (b), and contains a conductive ingredient as a pattern formation ingredient is made to breathe out. The electric conduction film 102 which serves as an electrode of a capacitor by this is formed. As a conductive ingredient of a pattern formation ingredient, RuO2, IrO2, OsO2, MoO2, ReO2, WO2, YBa2Cu 3O7-x, Pt, Au, Ag and In, an In-Ga alloy, Ga, solder, etc. can be considered. As a solvent, butyl carbitol acetate, a 3-dimethyl-2-IMITAZO lysine, BMA, etc. can be considered. As a fluid 12 containing a conductive ingredient, low-melt point point metals, such as In-Ga, In, and solder, may be used, where melting is carried out with heating etc. The pattern of the

electric conduction film can be changed into the configuration of other versatility of a form like drawing 2 thru/or drawing 4 . For example, the capacity of a capacitor can be made to increase further, if it forms so that the electrode which forms each electric conduction film and an insulator layer serrate and in the shape of toothing, and counters may get into gear. In order to enlarge capacity of a capacitor, it is desirable to form highly the height of an insulator layer 101 and the height of the opposed face of the electric conduction film 102, and to enlarge an electrode surface product.

[0029] Subsequently, in order to acquire desired electrical characteristics, solidification of the electric conduction film is performed. When the fluid 12 contains the particle of conductive ingredients, such as a metal, as a pattern formation ingredient, as shown in drawing 5 R> 5 (a) and (b), particles are scattered in a solvent at fluid 12b breathed out from the ink jet type recording head 22. Only by evaporating a solvent from this fluid, a pattern formation ingredient does not continue and conductivity cannot be secured. For this reason, as shown in drawing 6 , it heats by solidification equipment 6 grade more than the melting point of a conductive ingredient. A solvent evaporates by this processing, and also a pattern formation ingredient dissolves, and a particle connects mutually and unifies. Also when a fluid 12 dissolves a pattern formation ingredient, a conductive ingredient is deposited by evaporating a solvent in heat-treatment. When pattern formation ingredients are ingredients, such as a metal heated more than the melting point, a conductive ingredient may be solidified by maintaining a pattern formation side to temperature lower than the melting point.

[0030] Moreover, the electric conduction film may be formed at a process as shown in drawing 7 thru/or drawing 9 . By this approach, the regurgitation of the fluid 13 which included the charge of a binder from the ink jet type recording head 23 as first shown in drawing 7 (a) and (b) is carried out to the pattern formation field of the electric conduction film. As such a charge of a binder, in not carrying out heating at high temperature, it uses thermosetting resin adhesive, elastomeric adhesive, emulsion system adhesives, etc. When carrying out heating at high temperature, the poly aromatics, ceramic system adhesives, etc. are mentioned. Subsequently, the particle 131 which has conductivity all over pattern formation side 100 as shown in drawing 8 (a) and (b), for example, metal powder, is sprinkled. Subsequently, if the particle 131 which has conductivity from the pattern formation side 100 is blown off as shown in drawing 9 (a) and (b), the particle 131 which has conductivity will paste only the pattern formation field to which the charge of a binder is applied, and it will remain in it. Then, if it heats to the temperature more than the melting point of the particle which has conductivity as drawing 6 explained, a particle 131 will dissolve on the front face of the charge of a

binder, it will connect mutually, and the continuation pattern which has conductivity will be formed. You may heat-treat by impressing a supersonic wave to coincidence, sprinkling a particle furthermore. According to heating by the supersonic wave, good pattern formation of electrical characteristics can be performed. Moreover, if the particle after adhesion of a particle is compressed, particles can connect and electrical characteristics can be raised. An approach besides compression and the above of a particle may be used together. In addition, the ingredient which has a dielectric besides [which has conductivity] an ingredient may be applied to the above-mentioned particle. The capacity of a capacitor can be raised if it applies to a capacitor. The inductance of a coil can be raised if it applies to a coil by making a magnetic material into the above-mentioned particle.

[0031] Moreover, when the electric conduction film has the pattern formation side 100 and low adhesion, the compatibility film may be formed as a substrate layer using the fluid which contained the ingredient with high compatibility to the fluid. For example, as shown in drawing 10 , the regurgitation of the fluid 14 with high compatibility is carried out to a membranous pattern formation field from the ink jet type recording head 24 to a fluid 12. For example, if a fluid 12 is an organic material, porous materials, such as resin, paraffin and an aluminum oxide, and a silica, will be breathed out, and the compatibility film 104 will be formed. Since the compatibility film 104 has a fluid 12 and good adhesion, if the regurgitation of the fluid 12 is carried out on the compatibility film 104 as shown in drawing 11 , a fluid 12 will stick on the compatibility film 104, and breadth and the good electric conduction film 102 of adhesion will be formed. On the other hand, when the electric conduction film has the pattern formation side 100 and too good adhesion and spreads too much, the non-compatibility film may be formed using the fluid containing the ingredient in which non-compatibility is shown to a fluid. For example, as shown in drawing 12 , the regurgitation of the fluid 15 with low compatibility is carried out to the both sides of the pattern formation field of the electric conduction film from the ink jet type recording head 25 to a fluid 12. For example, if a fluid 12 is the ingredient in which a hydrophilic property is shown, porous materials, such as resin, paraffin and an aluminum oxide, and a silica, will be breathed out, and the non-compatibility film 105 will be formed. Since the non-compatibility film 105 crawls a fluid 12, if the regurgitation of the fluid 12 is carried out along a pattern formation field as shown in drawing 13 , with the non-compatibility film 105 of both sides, a fluid 12 will be crawled and a fluid will not spread more than the gap of the non-compatibility film 105. For this reason, the electric conduction film 102 with which the form was ready is formed. In addition, what has adhesion, such as a low dielectric

ingredient, SiO2, aluminum2O3, and TiO2, and insulation is mentioned to the effective ingredient as a substrate layer. In addition, the process which prepares the above-mentioned compatibility film and the non-compatibility film may be applied to the film of an insulator layer and others.

[0032] A capacitor 121 can be formed in the pattern formation side 100 as an electrical circuit according to many above-mentioned processes. As a result of actually measuring, when the capacity of a capacitor 121 is insufficient, if the electric conduction film 102 is lengthened, the area of a counterelectrode is extended or a dielectric ingredient is breathed out to the extension of an insulator layer 101 top or the electric conduction film 102, fine tuning of capacity is possible. If the capacitor formed first is set a little as ****** from a desired capacity, capacity is made to increase behind and it can be set as the optimal capacity.

[0033] Since the insulator layer and electric conduction film of a capacitor are formed with an ink jet method according to this operation gestalt 1 as mentioned above, the capacitor of the configuration of arbitration can be manufactured with the cheap and small equipment according to the ink jet printer used by the home printer. Even when fine tuning is required, capacity can be easily increased to especially the capacity of a capacitor.

[0034] (Operation gestalt 2) The operation gestalt 2 of this invention manufactures the electrical circuit containing the capacitor of a gestalt which is different in the above-mentioned operation gestalt 1. With this operation gestalt 2, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used.

[0035] (The manufacture approach) Next, based on drawing 14 thru/or drawing 16 , the formation approach of the capacitor of this operation gestalt is explained. In each drawing, (a) shows the production process sectional view cut with the center line of a circuit element, and (b) shows a top view.

[0036] Electric conduction film formation process (drawing 14) : First, the ink jet type recording head 22 is moved to the field which forms the electric conduction film, as shown in drawing 14 (a), and the fluid 12 which contains a conductive ingredient as a pattern formation ingredient from the head 22 concerned is made to breathe out. About a fluid 12, it is the same as that of the above-mentioned operation gestalt 1. In order to enlarge capacity of a capacitor, the electric conduction film 102 is formed in as big a field as possible. If a head 22 is moved like the arrow head of drawing 14 (b) and the regurgitation of the fluid 12 is carried out, the electric conduction film 102 used as the bottom electrode of a capacitor can be formed. What is necessary is just to process like the above-mentioned operation gestalt 1 about solidification.

[0037] Insulator layer formation process (drawing 15) : A bottom electrode is covered, the ink jet type recording head 21 is moved so that it may be shown subsequently to drawing 15 (a), and the fluid 11 which contains an insulating ingredient as a pattern formation ingredient from the head 21 concerned is made to breathe out. About a fluid 11, it is the same as that of the above-mentioned operation gestalt 2. A head 21 is moved like drawing 15 (b), and the regurgitation of the electric conduction film 102 which is a bottom electrode about a fluid 11 is carried out to a wrap pattern formation field. Although the width of face of an insulator layer 101 has the capacity of a capacitor raised so that it is thin, it also has the risk of an inter-electrode short circuit. For this reason, an insulator layer 101 is formed in the thickness which is extent from which sufficient insulation is obtained. Moreover, the capacity of a capacitor can be raised if an insulator layer 101 is formed with a dielectric ingredient. About solidification of a fluid 11, it is the same as that of the above-mentioned operation gestalt 1.

[0038] Electric conduction film formation process (drawing 16) : If an insulator layer 101 solidifies, as shown in drawing 1616 (a), will move the ink jet type recording head 21 on an insulator layer, and the fluid 12 which contains a conductive ingredient from the head 22 concerned will be made to breathe out, and the laminating of the electric conduction film 102 will be carried out further. Move a head 22 like the arrow head of drawing 16 (b), and breathe out a fluid 12, it is made to solidify, and the electric conduction film 102 used as the upper electrode of a capacitor is formed. About a fluid 12 and its solidification, it is the same as that of the above-mentioned operation gestalt 1.

[0039] A capacitor 122 can be formed in the pattern formation side 100 as an electrical circuit according to the above-mentioned process. In addition, it is desirable to form the area of an upper electrode more smallish to the area of a bottom electrode. It is because capacity can be made to increase easily if the area of an upper electrode is made to increase by the ink jet method to change capacity behind.

[0040] As mentioned above, according to this operation gestalt 2, the same effectiveness as the above-mentioned operation gestalt 1 is done so, and also since the area of an electrode can be set up greatly, a mass capacitor can be manufactured. If especially the upper electrode is formed more smallish, fine tuning of the capacity of a capacitor is possible only by making the area of an upper electrode increase.

[0041] (Operation gestalt 3) The operation gestalt 3 of this invention manufactures the electrical circuit containing a coil. With this operation gestalt 3, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used.

[0042] (The manufacture approach) Based on drawing 17 thru/or drawing 19 , the

formation approach of the coil of this operation gestalt is explained. In each drawing, (a) shows the production process sectional view cut with the center line of a circuit element, and (b) shows a top view.

Electric conduction film formation process (drawing 17) : The fluid 12 containing a conductive ingredient is made to breathe out, moving the ink jet type recording head 22, as first shown in drawing 17 (a) and (b), and the electric conduction film 102 equivalent to the outgoing line of a coil is formed. About a fluid 12 and its solidification, it is the same as that of the above-mentioned operation gestalt 1. In addition, the inductance of a coil can be made to increase, if a magnetic material is beforehand applied on the pattern formation side 100 or a magnetic material is applied between the spiral electric conduction film 102.

[0043] Insulator layer formation process (drawing 18) : The fluid 11 which is made to move the ink jet type recording head 21 so that it may be shown subsequently to drawing 18 (a), and contains an insulating ingredient is made to breathe out, as shown in drawing 1818 (b), it leaves the tip of the electric conduction film 102, and an insulator layer 101 is formed. An insulator layer may be prepared only in a part for the intersection of the electric conduction film which does not prepare an insulator layer greatly as shown in this drawing, but is formed by drawing 17 , and the electric conduction film formed by drawing 19 . About a fluid 11 and its solidification, it is the same as that of the above-mentioned operation gestalt 1.

[0044] Whirl electric conduction film formation process (drawing 19) : It is made to move spirally, as shown in drawing 19 (a), making the fluid 12 which subsequently contains a conductive ingredient from the ink jet type recording head 21 breathe out, and the spiral electric conduction film 102 is formed. This spiral electric conduction film 102 touches the electric conduction film 102 which the core formed by drawing 17 as shown in drawing 19 (b). The electric conduction film which formed every curled form part previously is not contacted. A vortical number of turns and the width of face of the electric conduction film 102 are defined according to the inductance value of a coil to manufacture. About a fluid 12 and its solidification, it is the same as that of the above-mentioned operation gestalt 1.

[0045] A coil 123 can be formed in the pattern formation side 100 as an electrical circuit according to the above-mentioned process. In addition, what is necessary is just to lengthen the further spiral electric conduction film 102 from a spiral edge to increase the inductance of a coil 123 behind. Moreover, what is necessary is just to add an outgoing line from the middle of the already formed spiral electric conduction film 102, when the phenomenon of the inductance is carried out.

[0046] As mentioned above, according to this operation gestalt 3, a coil can be easily manufactured as an electrical circuit with an ink jet method. moreover -- increasing an inductance behind or making it decrease **** -- etc. -- fine tuning can also be made easy.
[0047] (Operation gestalt 4) The operation gestalt 4 of this invention manufactures the electrical circuit containing a resistor. With this operation gestalt 4, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used. However, it has further the tank 33 and the ink jet type recording head 23 for carrying out the regurgitation of the fluid 13 which contained the electrical resistance materials of half-conductivity as a pattern formation ingredient. As electrical resistance materials, mixing [with conductive powder and insulating powder], nickel-Cr, Cr-SiO, Cr-MgF, Au-SiO2, AuMgF, PtTa 2O5, AuTa2O5Ta2, Cr3Si, and TaSi2 grade is mentioned, and PGMEA, a cyclohexane, carbitol acetate, etc. are mentioned as the solvent. As a wetting agent or a binder, a glycerol, a diethylene glycol, ethylene glycol, etc. may be added if needed. Moreover, as a fluid 13 containing an insulating ingredient, the metal alkoxide containing polysilazane or an insulator ingredient may be used. In this case, an insulator ingredient can be formed by heating, a chemical reaction, etc. Electrical resistance materials are decided according to the resistance of a resistor to form.
[0048] (The manufacture approach) Based on drawing 20 thru/or drawing 22 , the formation approach of the resistor of this operation gestalt is explained. In each drawing, (a) shows the production process sectional view cut with the center line of a circuit element, and (b) shows a top view.
Resistance film formation process (drawing 20) : The ink jet type recording head 23 is moved as first shown in drawing 20 (a) and (b). And the fluid 13 which contains electrical resistance materials from the head 23 concerned is made to breathe out, and the resistance film 103 for giving electric resistance is formed. About solidification, it is the same as that of the above-mentioned operation gestalt 1. In addition, about the width of face, height, and length of the resistance film 103, it decides according to the resistance of a resistor to form. It is because the resistance of a resistor is proportional to die length and it is in inverse proportion to the cross section. In addition, this resistance film 103 of setting up height and width of face so that it may become bigger resistance than the resistance used as a target is desirable. It is because the height and width of face of the resistance film 103 can be made to be able to increase behind and resistance can be lowered to a proper value.
[0049] Electric conduction film formation process (drawing 21 and drawing 22) : If the half-electric conduction film 103 solidifies, the ink jet type recording head 22 will be moved as shown in drawing 21 and drawing 22 , the fluid 12 containing a conductive

ingredient will be breathed out, and the electric conduction film 102 will be formed in the both ends of the half-electric conduction film 103. About a fluid 12 and its solidification, it is the same as that of the above-mentioned operation gestalt 1.

[0050] A resistor 124 can be formed in the pattern formation side 100 as an electrical circuit according to the above-mentioned process. In addition, if a fluid 13 is further breathed out on the half-electric conduction film 103, thickness of the half-electric conduction film 103 is thickened or width of face is enlarged to tune the resistance of a resistor 124 finely behind, resistance can be lowered even to a proper value.

[0051] As mentioned above, according to this operation gestalt 4, a resistor can be easily manufactured as an electrical circuit with an ink jet method. Moreover, it can also make it easy to tune resistance finely behind.

[0052] (Operation gestalt 5) The operation gestalt 5 of this invention applies this invention to wiring in the meantime using the conventional discrete part as a circuit element. With this operation gestalt 5, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used. However, the process by the equipment or the help for arranging components to the pattern formation side of a substrate 1 is required. Based on drawing 23 and drawing 24 , the electrical circuit manufacture approach of this operation gestalt is explained. Each drawing is a top view of a pattern formation side.

Components arrangement process (drawing 23) : By the insertion machine or the help, discrete part is arranged in a suitable location on the pattern formation side 100 of a substrate 1. The arrangement is defined according to an electrical circuit to manufacture. In drawing 23 , the resistor 110, the capacitor 111, and the transistor 112 are arranged as a chip. As for each part article, it is desirable to paste up with bond etc. In addition, it is desirable to also perform this adhesion with an ink jet method. For example, as shown in drawing 25 (a) and (b), the discharge adhesion film 107 is formed in a field to paste up components for the fluid 17 containing the charge of a binder from the ink jet type recording head 27. Since this adhesion film 107 has only to be able to carry out the temporary stop of the components, it may be formed in a field smaller than the area covered with components. And what is necessary is just to stick components (resistor 110) by insertion machine 7 grade on the adhesion film 107, as shown in drawing 2626 . In addition, the resin hardened with an epoxy resin or energy as a charge of a binder is applied. For example, components can be pasted up by temperature setup of the heat which will be applied if thermosetting resin and thermoplastics are used.

[0053] Wiring process (drawing 24) : If components paste up, the circuit pattern which

connects between components using the fluid 12 which contains a conductive ingredient as a pattern formation ingredient is formed. About a conductive ingredient or its solidification, it is the same as that of the above-mentioned operation gestalt 1. What is necessary is to form an insulator layer 101 in a part for the intersection of wiring, and just to form the electric conduction film 102 further on it after forming the electric conduction film 102 which turns down, when making a circuit pattern cross. In addition, the circuit pattern which consists of electric conduction film 102, and the terminal of each part article may be soldered. You may solder by the ink jet method. If solder is heated more than a melting temperature and it is made to breathe out from an ink jet type recording head, soldering will be made easily.

[0054] In addition, although discrete part performed the circuit element and being wired by the ink jet method in the above-mentioned operation gestalt, a part or all of a circuit element may be manufactured by the ink jet method like each above-mentioned operation gestalt. That is, discrete part is adopted as a mass capacitor, the coil of a high inductance, and the active element of a complicated configuration, and an ink jet method is applied to the circuit element which can be easily formed in a pattern formation side.

[0055] As mentioned above, also when discrete part is used, according to this operation gestalt 5, wiring can be easily done with an ink jet method. An electrical circuit can be manufactured even if there is a circuit element which is hard to form especially by the ink jet method. Moreover, if the fixed form substrate which has arranged discrete part by fixed arrangement beforehand is manufactured, the electrical circuit of arbitration can be constructed using an ink jet method.

[0056] (Operation gestalt 6) In case the operation gestalt 6 of this invention forms many circuit patterns in a pattern formation side like the operation gestalt 5, it is related with the manufacture approach of an electrical circuit of making each other identifying. With this operation gestalt 5, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used. However, the tank 22 and the ink jet type recording head 22 which make the fluid 12 containing a conductive ingredient breathe out are made to correspond to the class of circuit pattern, and are prepared. [two or more] The different color and different pigment of a color are made to mix in each fluid 12, and it constitutes. As a color, a stilbene system, an oxazole system, an imidazolone system, a coumarin system, etc. can be used as fluorescent whitening dye. An azo system, an anthraquinone system, an indigo system, and a sulfuration system can be used as a general color. FENOJIN will be mentioned, if it is specifically made black, will be made 2, 4-dinitrophenols and yellow and will be made m-toluylene diamines and red.

As a pigment, an insoluble azo system, an azo lake system, a phthalocyanine system, etc. can be used. Since the pigment consists of coloring particles, a single molecule does not check electric conduction like a color. For this reason, it is more desirable to use a pigment. Each circuit pattern is classification-by-color beam ****** by wiring of an analog circuit, and wiring of a digital circuit in classifying by color by for example, power-source wiring, touch-down wiring, and its outcrossing line ****. For example, in drawing 27 , it is classified by color with the power-source wiring 108, the touch-down wiring 109, and the other wiring 102. What is necessary is just to form an insulator layer 101 in a part for the intersection of wiring, as shown in drawing 27 (b) when a circuit pattern crosses.

[0057] In addition, the circuit pattern itself may not be classified by color, but a circuit pattern may be classified by color by the wrap coloring film. For example, in drawing 28 , the coloring film 130 covers the electric conduction film 102 which is a circuit pattern, and it is formed. Formation of the coloring film 130 should just make the resin in which the pigment and the color were included breathe out with an ink jet method. If the coloring film 130 is formed by resin etc., since it has insulation, insulation can be secured even when a circuit pattern crosses. Moreover, since neither a pigment nor a color is contained in the electric conduction film 102, a possibility of checking electric conduction also disappears. You may classify by color by using a conductive ingredient properly according to a circuit pattern, without furthermore using a color for the conductive ingredient itself using there being a color of a proper. For example, in white, if it is copper and is silver and platinum about red, if it is gold, it is yellowish. Therefore, if the fluid containing a different conductive ingredient is breathed out and the electric conduction film is formed instead of changing a pigment and a color, a certain amount of classification by color is possible.

[0058] Moreover, what did not necessarily need to manufacture by the ink jet method and was manufactured, other the approaches, for example, photolithography method etc., etc., is sufficient as a circuit pattern. As long as the circuit pattern is classified by color, it is because the same effectiveness is done so.

[0059] Since according to this operation gestalt 6 the circuit pattern of each other was classified by color and manufactured as mentioned above, according to the electrical circuit concerned, it is easy to recognize the path and components of wiring at the time of failure and amelioration of a circuit, and leads to easy-ization of an activity. Moreover, also when classification by color is adopted with a production line, maintenance and check can be made easy.

[0060] (Other modifications) it is not based on the above-mentioned operation gestalt,

but this invention can be deformed and applied to versatility For example, although the above-mentioned operation gestalt showed the manufacture approach of a capacitor, a coil, and a resistor, this invention may be applied to manufacture of active elements, such as diode and a transistor. What is necessary is just to use as a fluid what doped various elements for semiconductor materials, such as silicon and germanium. You may dope behind. By carrying out the laminating of many semi-conductor film of an electronic majority carrier, and reactionary film of an electron hole majority carrier in various configurations, adjusting a carrier consistency, it is also possible to manufacture the semi-conductor which was being manufactured with epitaxial growth with an ink jet method. If the same laminated structure as various kinds of semi-conductors which were being manufactured in the usual semi-conductor process is formed, all well-known semiconductor devices can be manufactured.

[0061] Moreover, before the regurgitation of the fluid by the above-mentioned ink jet method, various surface treatment processings may be combined and may be performed. For example, well-known various approaches, such as the approach to which a reverse spatter is applied with the approach of applying a silane coupling agent according to the existence of the polar molecule of a fluid as processing which carries out surface treatment so that a pattern formation side may be equipped with compatibility, an argon, etc., corona discharge treatment, plasma treatment, UV irradiation processing, ozonization, and cleaning processing, are applied. When a fluid does not contain a polar molecule, well-known various approaches, such as the approach to which a reverse spatter is applied with the approach of forming porous membrane, such as the approach and aluminum oxide which apply a silane coupling agent, and a silica, an argon, etc., corona discharge treatment, plasma treatment, UV irradiation processing, ozonization, and cleaning processing, can be applied. It may etch into the film formed by the pattern formation side or the ink jet method, irregularity may be prepared, and compatibility may be adjusted.

[0062] The pattern furthermore formed by the ink jet method may be formed in a pattern formation side not only for an electrical circuit but for the mechanical ******-[again] purpose. It is because the advantage of the ink jet method that a detailed pattern can be easily formed with a cheap facility can be made to enjoy as it is.

[0063]

[Effect of the Invention] Since the pattern of arbitration can be formed in a pattern formation side by making a fluid adhere according to this invention, the electrical circuit suitable for little variety production or a prototype, its manufacture approach, and a manufacturing installation can be offered. That is, the electrical circuit of cheaply

fixed quality can be offered, without using a large-scale plant. Moreover, since addition of a pattern is easy according to the ink jet method, modification of a circuit constant and the addition of wiring in a circuit element can be performed easily.

[0064] Since according to this invention the color was changed according to the pattern and discernment of a pattern was made easy, the electrical circuit suitable for a prototype and its manufacture approach can be offered. Therefore, also in a prototype, it becomes analyzable [a circuit] for a short time, and the increase in efficiency of circuit evaluation can be attained.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the electrical circuit manufacturing installation in the operation gestalt 1 of this invention.

[Drawing 2] It is the insulator layer formation process of the formation approach of the capacitor in the operation gestalt 1.

[Drawing 3] It is the electric conduction film formation process of the formation approach of the capacitor in the operation gestalt 1.

[Drawing 4] It is the electric conduction film formation process of the formation approach of the capacitor in the operation gestalt 1.

[Drawing 5] It is a regurgitation process at the time of using the fluid containing a particle.

[Drawing 6] It is a heating process at the time of using the fluid containing a particle.

[Drawing 7] It is an adhesion film formation process at the time of using adhesives.

[Drawing 8] It is a particle spraying process at the time of using adhesives.

[Drawing 9] It is a particle removal process at the time of using adhesives.

[Drawing 10] It is a compatibility film formation process.

[Drawing 11] It is an electric conduction film formation process in the case of using the compatibility film.

[Drawing 12] It is a non-compatibility film formation process.

[Drawing 13] It is an electric conduction film formation process in the case of using the non-compatibility film.

[Drawing 14] It is the electric conduction film formation process of the formation